Dynamic Soil Properties as a Part of Soil Survey Updates: Illustration of the Utility of the Results from Arches National Park, Utah

Judy P. Ward[1], Arlene J. Tugel[2], Jeffrey E. Herrick[3], Marta D. Remmenga[1], Cathy Scott[4], Dana Truman[5], Vic Parslow[4], Pete Biggam[6], Cathy Seybold[7], Ellis C. Benham[7], Brandon T. Bestelmeyer[3], Amanda Moore[8], and Fred Young[9]

[1]New Mexico State University, Las Cruces, NM; [2]NRCS, Las Cruces, NM; [3]USDA-ARS Jornada Experimental Range; [4]NRCS, Richfield, UT; [5]NRCS, Price, UT; [6]USDI-National Park Service; [7]NRCS, Lincoln, NE; [8]NRCS, Morgantown, WV; [9]NRCS, Columbia, MO
jward@nmsu.edu atugel@nmsu.edu

Abstract

Managing natural parks to preserve fundamental natural resources, processes, systems and values for future generations ultimately depends on sound soil resource management. The natural features and diverse plant and animal communities of parks depend particularly on maintaining soil functions that support plant growth and limit soil erosion. Dynamic soil properties are key to soil functions, yet are inadequately addressed in standard soil survey procedures. Protocols for measuring dynamic soil properties and interpreting the functions of soils are therefore needed to define requirements for soil inventories of the national parks. Through soil survey updates and benchmark soil studies, soil scientists can collect data on soil and ecosystem change in order to meet user needs related to human impacts on soil. A pilot study to evaluate new sampling methods for dynamic soil and vegetation properties was conducted at Arches National Park in Utah. We sampled functionally important dynamic properties of the Begay soil (coarse-loamy, mixed, superactive, mesic Ustic Haplocambid) underlying two distinct plant communities within two proposed states of the Semidesert Sandy Loam (Fourwing Saltbush) ecological site (MLRA 35 Colorado Plateau). We integrated and co-located soil and vegetation measures to ascertain the relationship between vegetation and near-surface dynamic soil properties. Vegetation properties included herbaceous production, basal and canopy cover, and vegetation gap size distribution, while soil properties included field soil stability, bulk density, penetration resistance, carbon (organic and active) and CaCO3% for multiple depth intervals. Here, we illustrate the types of results and value of the results obtained using the pilot sampling approach. We focus on three primary types of results: (1) sample size requirements to detect a functionally significant difference in the properties; (2) characterization and comparison of the central tendency and variation in order to assist selection of indicators; and (3) evaluation of the relationship between vegetation and soil properties to provide information for Ecological Site Descriptions.